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EXAMINER	
VADEN, KENNETH I	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/555,000	GOBINA ET AL.	
	Examiner	Art Unit	
	KENNETH VADEN	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 February 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 October 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claim 17 recites the limitation "the second reactant" in claim 17, line 7. There is insufficient antecedent basis for this limitation in the claim.

Response to Arguments

The Applicant's amendment to claim 38 is accepted. The rejection of this claim under *35 USC § 112 is withdrawn. Attorney's arguments made in the case are directed to separate supply for oxygen and methane so that the gases are fed separately into the apparatus, natural pressure differential and highly dispersed catalyst described in the specification but not claimed. The 35 USC § 103(a) rejections of claims 1-40 are therefore maintained.*

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-3, 5, 12-25, 28, 29, 30 and 40 rejected under 35 U.S.C. 103(a) as being unpatentable over Barnes (US 6,448,907), in view of Abeles (US 5,846,641). Regarding claim 1, Barnes "907" teaches the use of a membrane made up of at least one catalytically active metal supported on a catalyst support consisting of an aluminum-containing alloy (Abstract lines 8-13). Barnes "907" also teaches that the first reactant is imparted with enough energy so as to react with the second reactant (col. 5, lines 53-56). Barnes "907" does not teach the use of chambers in the apparatus. Abeles "641" teaches the apparatus consisting of a first chamber, a second chamber and a membrane dividing the first and second chambers (Fig 2(a), which allows passage of the first reactant from the first chamber to the second chamber through the membrane. It would have been obvious to one of ordinary skill in the art at the time of the invention for Barnes to have used the chambers of Abeles to facilitate the reaction of the two reactants.

5. Regarding claim 2, Barnes "907" teaches an apparatus in which the support is adapted to operate at temperatures exceeding 250 degrees C (col. 7, lines 23-25).

6. Regarding claim 3, Barnes "907" teaches a support in which the support consists of an inorganic support (Abstract lines 8-13).

7. Regarding claim 5, Barnes "907" teaches that the membrane is adapted to activate molecules of the first reactant without forming an ionic species before the reaction with the second reactant (col. 8, lines 13-28).

8. Regarding claim 12, Barnes "907" teaches the use of rhodium, a metal catalyst (col. 7, lines 37-38).

9. Regarding claim 13, Barnes "907 teaches the use of a metal catalyst selected from the group consisting of rhodium, ruthenium and nickel (col. 7, lines 37-38).

10. Regarding claim 14, Barnes "907" teaches an apparatus in which the membrane is provided in the shape of a cylinder (col. 7, lines 66-67 and col. 8, lines 1-4).

11. Regarding claim 15, Barnes "907" teaches the use of alternating catalyst discs and quartz spacers with ends capped at each end with alumina foam discs in the membrane. This serves the same purpose as struts which are included in the specification to increase the surface area of the inner bore since the surface area of both the foam discs and the catalyst is increased by using discs as opposed the solid materials with pores as in the quick claim (col. 7, lines 61-66).

12. Regarding claim 16, Barnes "907" teaches the use of a support consisting of alpha-alumina (col.7, lines 37-38).

13. Regarding claim 17, Barnes "907" teaches the method of producing hydrogen gas in which a membrane consisting of a support and a catalyst (Abstract, lines 8-13), sending the first reactant through the support and catalyst allowing the first reactant to come into contact with the catalyst upon passage through the support and catalyst, imparting the first reactant with enough energy to react with the second reactant, reacting the first reactant with the second reactant to produce hydrogen gas (Abstract, lines 1-13).

14. Regarding claim 18, Barnes "907" teaches a method in which the energy imparted on the first reactant activates molecules of the first reactant without forming an ionic species before the reaction with the second reactant (col. 8, lines 13-20).

15. Regarding claim 19, Barnes "907" teaches a method as claimed in claim 17 in which the temperature is over 500 degrees C. (Col. 5, lines 53-58).

16. Regarding claim 20, Barnes "907" teaches the method in claim 19 in which the temperature is between about from 600–1300 degrees C (col. 5, lines 53-55). This range overlaps the range of 700-800 degrees C disclosed in claim 20.

17. Regarding claim 21, Barnes "907" teaches a method in which the first reactant is the one of oxygen and a hydrocarbon and the second reactant is the other of oxygen and a hydrocarbon (col. 4, lines 13-17).

18. Claims 22 and 24 rejected under 35 U.S.C. 103(a) as being unpatentable over Barnes "907" as applied to claim 17 above, in view of Abeles (US 5846641).

19. Regarding claim 22, Barnes “907” does not teach the use of chambers for the reaction of the two reactants. Abeles “641” teaches oxygen and the hydrocarbon coming into contact with each other only after the first reactant has passed through the membrane from the first chamber to the second chamber (col. 2, lines 12-18 and Fig. 2(a)). It would have been obvious to one of ordinary skill in the art at the time of the invention Barnes "907" to use the chambers of Abeles to assure the timely contact of the reactants in the production of hydrogen gas.

20. Regarding claim 24, Barnes “907” does not teach that the pressure in the first chamber is greater than the pressure in the second chamber. Abele “641” teaches that the pressure in the first chamber is 15 psi and the pressure in the second chamber is 350 psi. It would have been obvious to one of ordinary skill in the art at the time of the invention that this pressure difference would be needed to promote his reaction (Fig 5 (a) and (b).

21. Regarding claim 23, Barnes “907” teaches a method in which a hydrocarbon consisting of a normally gaseous hydrocarbon (col. 5, lines 25-28).

22. Regarding claim 25, Barnes “907” teaches a method in which carbon monoxide is formed in addition to hydrogen (col. 4, lines12-17).

23. Regarding claim 28, Barnes “907” teaches a method of preparing a membrane consisting of a support and a catalyst added to the support (col. 4, lines 53-67).

24. Regarding claim 29, Barnes “907” teaches the use of an inorganic support (col. 4, lines 59-67).

25. Regarding claim 30, Barnes "907" teaches the method which includes the coating of one of the surfaces of the support (col. 4, lines 53-67).

26. Regarding claim 35, Barnes "907" teaches the coating of the membrane to produce a flux control layer on the membrane (col. 7, lines 37-38). This is because adding the catalyst coating to the support would restrict the oxygen flux.

27. Regarding claim 40, Barnes "907" teaches the step which involves drying the support and heating/ firing the support (col. 4, lines 33-37).

28. Claims 4, 6, 7, 8, 9, 10, 11, 31 and 36 rejected under 35 U.S.C. 103(a) as being unpatentable over Barnes "907" in view of Abeles as applied to claims 1 and 30, and further in view of Carolan (US 5569633).

29. Regarding claim 4, Barnes"907" does not teach the graduation of pores radii in the support. Carolan "633" teaches the graduation of pore radii in the support toward one surface of the porous support layer. It would have been obvious to one of ordinary skill in the art at the time of the invention that Barnes would have used the graduation of pores to control the flow of the first reactant through the support and catalyst controlling the reaction rate(col. 7, lines 15-23)

30. Regarding claims 6, 7, and 31 Barnes "907" does not teach the roughened surface and increased tortuosity of the support. Carolan "633" teaches that the pore radius for the support increases as the pore travels through the support to the surface would appear roughened and the surface would have a greater amount of tortuosity (col.7, lines 15-22). It would have been obvious to one of ordinary skill of the art at the

time of the invention that Barnes would have used the roughened surface and greater tortuosity to increase contact of the first reactant with the catalyst.

31. Regarding claims 8 and 10, Barnes “907” teaches the use of a catalyst, rhodium, coated on the alumina support (col. 7, lines 37- 38) Barnes does not teach a flux control layer consisting of an inorganic porous layer which is adapted to hold a portion of the catalyst to control the passage of the first reactant through the membrane. Carolan “633” teaches that the flux of the first reactant is regulated using the porosity and average pore radius of the porous layer (col.8, lines 17-20). It would have been obvious to one of ordinary skill in the art at the time of the invention to control the flux of the first reactant using the average pore size.

32. Regarding claim 11, Barnes "907" teaches the use of porous alumina foam discs in the flux control layer (col. 7, lines 61-67 and col. 8, lines 57-60).

33. Regarding claim 9, Barnes”907” does not teach a flux control layer on the first surface of the support and in which the layer with the roughened surface on the opposite surface of the support. Carolan “633” teaches that the porosity and the average pore radius should be regulated such that the oxygen flux is not impeded (col. 7, lines 17-19). Carolan also teaches the use of a roughened surface on the support (col. 7, lines 16-22). It would have been obvious to one of ordinary skill in the art at the time of the invention for Barnes to use a flux control layer and a roughened surface to increase the rate of reaction for the reactants.

34. Claim 36 rejected under 35 U.S.C. 103(a) as being unpatentable over Barnes "907" in view of Abeles "641" as applied to claim 28 above, and further and further in view of Carolan (US 5569633).

35. Regarding claim 36, Barnes "907" does not teach that a flux control layer is applied to the support. Carolan "633" teaches that the porosity and pore radius change the oxygen flux (col. 8, lines 18-20). . It would be obvious to one of ordinary skill in the art at the time of the invention that Barnes should have achieved control over oxygen flux by changing porosity and a pore radius.

36. Claim 26 and 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Barnes "907" in view of Abeles "641" as applied to claims 20 and 25,and further in view of Roberts (US 6114399) and Galloway (US 6187465).

37. Regarding claim 26, Barnes "907"does not teach the case in which carbon monoxide and hydrogen are further reacted to produce normally liquid hydrocarbons in a Fischer-Tropsch type reaction. Roberts "399" teaches the conversion of synthesis gas to a liquid hydrocarbon product (Abstract and Figs. 1 and 2). It would have been obvious to one of ordinary skill in the art at the time of the invention for Barnes to use a Fischer-Tropsch reaction to convert a portion of his synthesis gas to a liquid hydrocarbon form.

38. Regarding claim 27, Barnes "907" does not teach the use of synthesis gas produced to be used as a fuel. Galloway ""465" the use of synthesis gas to be oxidized in an electricity-producing fuel cell (Abstract, lines 7-10). It would have been obvious to

one of ordinary skill in the art at the time of the invention for Barnes "907" to use the invention of Galloway to generate electricity using his synthesis gas of his invention.

39. Claims 32, 33, 34, 37, 38 and 39 rejected under 35 U.S.C. 103(a) as being unpatentable over Barnes "907" in view of Abeles "641" as applied to claim 28 above and further in view of Oki (US 6399540) and Moon (US 7256154).

40. Regarding claim 32, 33 and 34, Barnes "907"does not teach coating with a metal oxide. Oki "540" teaches the use of a coating consisting of a metal oxide, titanium oxide (Abstract, lines 1-12). It would have obvious to one of ordinary skill in the art at the time of the invention for Barnes to have used the titanium oxide coat to increase the yield in his reaction.

41. Regarding claim 37 and 38, Barnes "907" does not teach the use of a flux control layer applied to the membrane by exposure to a boemite solution. Moon "154" teaches the application of a boemite solution for coating a ceramic honeycomb catalyst support (col. 3, lines 45-67). It would have been obvious to one of ordinary in the art at the time of the invention for Barnes to use the boemite coating for his support the increase the yield of his reaction.

42. Regarding claim 39, Barnes "907" does not teach the step of dissolving the titanium oxide. Oki "540" teaches the step of dissolving the titanium oxide which would likely be applied to the surface of the support. The application could be performed either by passing the solution over the support or by using osmosis to absorb the catalyst (col. 13, lines 37-39 and col. 14, lines 1-19).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KENNETH VADEN whose telephone number is (571)270-5824. The examiner can normally be reached on M-Th 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Melvin Curtis Mayes can be reached on (571)272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kenneth Vaden
May 29, 2009

/Melvin Curtis Mayes/
Supervisory Patent Examiner, Art Unit 1793